

### **REMARKS**

Claims 1-9, 11-15 and 17-22 are pending in the above-identified application. No new matter has been added by way of the present submission. For instance, claim 1 has been amended so as to incorporate the textual subject matter of claim 10 and claim 11 has been amended so as to incorporate the textual subject matter of claim 16. Claims 10 and 16 have subsequently been cancelled. Thus, no new matter has been added.

Applicants also point out that no new issues have been raised by way of the present submission. For instance, claim 1 and claim 11 now reflect the previously searched and examined subject matter of claim 10 and claim 16, respectively. Therefore, the Examiner is not presented with any additional administrative burden of search and/or consideration in view of the fact that claims 10 and 16 were already searched and examined. Thus, no new issues are raised.

In view of the following remarks, the Examiner is respectfully requested to withdraw all rejections and allow the currently pending claims.

#### **Issues under 35 USC 103(a)**

Claims 1-4, 8-16, and 19-22 have been rejected under 35 USC 103(a) as being unpatentable over Tsukamoto '985 (JP 2000-143985) in view of Bertram '244 (US 4,162,244).

Claims 5-7 and 17-18 have been rejected under 35 USC 103(a) as being unpatentable over Tsukamoto '985 in view of Bertram '244, and further in view of Hedaya '492 (US 4,208,492).

Applicants respectfully traverse each of these rejections.

The Present Invention and Its Advantages

Independent claim 1 relates to a black composition comprising as indispensable components a titanium nitride oxide, a resin and a solvent; wherein X-ray intensity ratios  $R_1$  and  $R_2$  represented by the Equations (1) and (2) below, respectively, satisfy the relationships represented by Formulae (3) and (4) below:

$$R_1 = I_3 / \{I_3 + 1.8(I_1 + 1.8I_2)\} \quad (1)$$

$$R_2 = I_2 / I_1 \quad (2)$$

$$R_1 > 0.70 \quad (3)$$

$$0.85 < R_2 < 1.80 \quad (4)$$

wherein  $I_1$  represents the maximum diffraction intensity of the titanium nitride oxide when the angle of diffraction  $2\theta$ , determined by using  $\text{CuK}\alpha$  line as the X-ray source, is  $25^\circ$  to  $26^\circ$ ,  $I_2$  represents the maximum diffraction intensity of the titanium nitride oxide when the angle of diffraction  $2\theta$  is  $27^\circ$  to  $28^\circ$ ,  $I_3$  represents the maximum diffraction intensity of the titanium nitride oxide when the angle of diffraction  $2\theta$  is  $36^\circ$  to  $38^\circ$ , and wherein a black coating film obtained from said black composition has an optical density (OD value) of not less than 4.4 per 1  $\mu\text{m}$  of film thickness, and wherein the minimum exposure energy required for photo-curing is not more than  $60 \text{ mJ/cm}^2$ .

Independent claim 11 is directed to a black composition comprising as indispensable components a titanium nitride oxide and a resin; wherein X-ray intensity ratios  $R_1$  and  $R_2$  represented by the Equations (1) and (2) below, respectively, satisfy the relationships represented by Formulae (3) and (4) below:

$$R_1 = I_3 / \{I_3 + 1.8(I_1 + 1.8I_2)\} \quad (1)$$

$$R_2 = I_2 / I_1 \quad (2)$$

$$R_1 > 0.70 \quad (3)$$

$$0.85 < R_2 < 1.80 \quad (4)$$

wherein  $I_1$  represents the maximum diffraction intensity of the titanium nitride oxide when the angle of diffraction  $2\theta$ , determined by using  $\text{CuK}\alpha$  line as the X-ray source, is  $25^\circ$  to  $26^\circ$ ,  $I_2$  represents the maximum diffraction intensity of the titanium nitride oxide when the angle of diffraction  $2\theta$  is  $27^\circ$  to  $28^\circ$ ,  $I_3$  represents the maximum diffraction intensity of the titanium nitride oxide when the angle of diffraction  $2\theta$  is  $36^\circ$  to  $38^\circ$ ; and wherein the transmittance of i-ray when the optical density (OD value) is 2.0 is more than 0.2%.

By way of the above-described black compositions, an object of the present invention is to provide a black coating composition which gives a highly adhesive resin black matrix that exhibits a high OD value which was able to previously be attained only by metal thin film black matrices. By using such a black coating composition, a resin black matrix which is thin, which has a high OD value and which is highly adhesive is obtained. As a result, a color filter having no over-coat, which previously could be attained only by using a metal thin film black matrix, may be attained by using a resin black matrix. Also, by employing a specific titan black, an advantageous effect that a resin black matrix having vertical edge portions can be obtained in addition to the advantageous features that the black matrix has a high OD value and high adhesiveness.

Distinctions over Cited References

From a review of the above rejections it is apparent that all claims have been rejected over the primary reference of Tsukamoto '985. Applicants will explain the deficiencies of Tsukamoto '985 as well as the inability of any of the other cited references of cure these deficiencies. The result of the analysis is that even if the prior art is combined as asserted by the Examiner, there can exist no *prima facie* case of obviousness. Therefore, all rejections should be withdrawn.

To start, Applicants point out that presently pending claim 1 is directed to a photosensitive composition since the coated film is photo-cured. By employing a specific titan black, an advantageous effect that a resin black matrix having vertical edge portions can be obtained in addition to the advantageous features that the black matrix has a high OD value and high adhesiveness. These advantageous features are described on page 9, first complete paragraph, of the specification of the present application. That is, as described therein, this is because that the curing of the film during the irradiation with light is easy to specifically proceed up to the lower portion of the film, in spite of the fact that the light hardly reaches the lower portion of the film due to the high OD value. Although the mechanism thereof has not necessarily been identified, the present inventors presume that the radicals generated by the irradiation with light diffuse into the lower portion of the film because the titanium nitride oxide used in the present invention has the properties that (1) the transmittance of ultraviolet light (especially, i-ray (365 nm)) is higher than those of the usual light shading agents, and (2) its ability to trap the radicals generated by the irradiation with light is much lower than those of the usual light shading agents.

Also, presently pending claim 11 has a feature that the transmittance of  $\gamma$ -ray when OD value is 2.0 is more than 0.2%. By this claimed feature, a resin black matrix that is obtained advantageously exhibits vertical edge portions. This is due to the fact that the curing of the film during irradiation with light is easy to specially proceed up to the lower portion of the film, even in view of the fact that the light hardly reaches the lower portion of the film due to the high OD value. This is as already described above.

In contrast, although Tsukamoto '985 disclose a resin black matrix employing titan black, **none of the resin black matrices of Tsukamoto '985 are photosensitive**. It is therefore not surprising that Tsukamoto '985 is totally silent concerning the above-described specific effects achieved by a photosensitive resin black matrix that satisfies the Formulae (3) and (4). Moreover, these deficiencies of Tsukamoto '985 cannot be cured by the additional disclosures of Bertram '244 and Hedeya '492.


Therefore, the references of Tsukamoto '985, Bertram '244 and Hedeya '492, whether taken alone or in combination, fail to provide sufficient disclosure to render the presently pending claims obvious. The Examiner is thus requested to withdraw the outstanding rejections. In view of this, the present claims define patentable subject matter such that this application should now be placed in condition for allowance.

If any questions arise in the above matters, please contact Applicant's representative, Andrew D. Meikle (Reg. No. 32,868), in the Washington Metropolitan Area at the phone number listed below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Dated: March 12, 2009

Respectfully submitted,

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